PINE RIVER POND

2013 SAMPLING HIGHLIGHTS

WAKEFIELD, NH

NEW HAMPSHIRE
LAKES LAY MONITORING

Pine River Pond volunteers collected water quality data between June 3 and September 6, 2013. A more in depth water quality survey of the Pine River Pond deep sampling stations was conducted by the Center for Freshwater Biology on August 16, 2013.

Blue = Excellent = Oligotrophic

Yellow = Fair = Mesotrophic

Red = Poor = Eutrophic

Light Gray = No Data

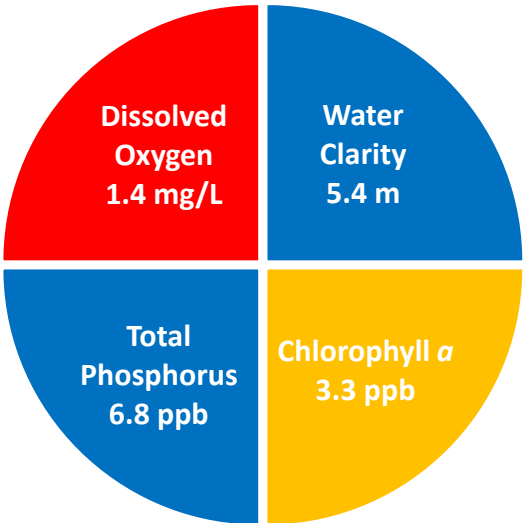


Figure 1. Average Water Quality Conditions

2013 RESULT HIGHLIGHTS

WATER CLARITY: Water clarity, measured as Secchi disk depth, averaged 5.4 meters (m) in Pine River Pond. The 2013 water clarity varied among sampling dates and was shallowest early in the season.

CHLOROPHYLL: Chlorophyll *a*, a measure of microscopic plant life within the lake, averaged 3.3 parts per billion (ppb) in Pine River Pond. The 2013 Pine River Pond chlorophyll *a* measurements varied among sampling dates. The highest chlorophyll *a* concentration of 4.0 ppb corresponded to the shallowest water clarity of 5.0 meters.

TOTAL PHOSPHORUS: Phosphorus is the nutrient most responsible for microscopic plant growth. The 2013 Pine River Pond total phosphorus concentrations remained well below 10 parts per billion (ppb) in the surface waters. The total phosphorus concentration of 10 ppb is considered sufficient to support green water events that are referred to as algal blooms. Total Phosphorus concentrations were higher near the lake bottom and included measurements above 10 ppb.

DISSOLVED OXYGEN: Dissolved oxygen is important for the health of fisheries. Dissolved oxygen concentrations measured near the lake bottom were below 5.0 milligrams per liter (mg/L). A dissolved oxygen concentration of 5.0 mg/l is commonly considered the threshold for the growth and reproduction of cold water fish, such as trout and salmon.

COLOR: Color is a result of naturally occurring "tea" color substances from the breakdown of soils and plant materials. The Pine River Pond color averaged 17.5 color units (CPU); Wet years tend to increase wetland drainage and the associated dissolved colored substances that enter the lake. This increase in the "tea" color reduces light penetration, and is oftentimes associated with shallower water clarity.

ALKALINITY: Alkalinity measures the lake's resistance against acid rain. The average alkalinity indicates Pine River Pond is moderately vulnerability to acid precipitation. The Pine River Pond **pH**, a measure of lake acidity, remained within the tolerable range for most aquatic organisms.

SPECIFIC CONDUCTIVITY: Specific conductivity is a general indicator of pollution. The Pine River Pond specific conductivity was 48.0 micro-Siemans per centimeter (uS/cm) and indicated moderate concentrations of dissolved substances, such as nutrients (e.g. phosphorus and nitrates) and other dissolved salts (e.g. sodium and chloride).

CYANOBACTERIA: Cyanobacteria are the measure of potentially harmful plant-like bacteria. Pine River Pond did not participate in the 2013 cyanobacteria monitoring. Please see recommendations on how to become involved.

Table 1. 2013 Pine River Pond Seasonal Average Water Quality Readings and Trophic Level Classification Criteria

Parameter	Oligotrophic "Excellent"	Mesotrophic "Fair"	Eutrophic "Poor"	Pine River Pond Average (range)	Pine River Pond Classification
Water Clarity (meters)	4.0 – 7.0	2.5 - 4.0	< 2.5	**5.4** meters (range: 5.0 – 5.8)	Oligotrophic
Chlorophyll *a* (ppb)	< 3.3	> 3.3 – 5.0	> 5.0 – 11.0	**3.3** ppb (range: 2.6 – 4.0)	Mesotrophic
Total Phosphorus (ppb)	< 8.0	> 8.0 – 12.0	> 12.0 – 28.0	**6.8** ppb (range: 5.9 – 7.6)	Oligotrophic
Dissolved Oxygen (mg/L)	5.0 – 7.0	2.0 – 5.0	<2.0	**1.4** mg/L (range: 0.6 – 2.5)	Eutrophic
Cyanobacteria (cell counts, microcystin concentration & Water safety)	The Massachusetts Department of Public Health considers dangerous microcystin (MC) levels to be 14 micrograms per liter (*ug*/l) lake water, and/or 70,000 cyanobacteria cells per milliliter lake water.		The New Hampshire Department of Environmental services posts warnings at State beaches when cyanobacteria cell numbers exceed 70,000 cells per milliliter lake water.		

Dissolved oxygen concentrations are reported for the bottom layer. The chlorophyll *a* and total phosphorus trophic Level classification criteria are based on New Hampshire Department of Environmental Services standards.

LONG TERM TRENDS

WATER CLARITY: The Pine River Pond water clarity data display a trend of decreasing water clarity over the past twenty-six years. However, the trend is not a statistically significant.

CHLOROPHYLL: The Pine River Pond chlorophyll *a* data display a trend of increasing chlorophyll *a* concentrations over the past twenty-seven years. However, the trend is not statistically significant.

TOTAL PHOSPHORUS: Total phosphorus concentrations display a trend of decreasing concentrations over the past twenty-seven years of sampling. However, the trend is not statistically significant.

In summary, decreasing long-term water clarity and increasing chlorophyll *a* concentrations are a reminder that Pine River Pond is susceptible to polluted runoff that enters the pond. While the current phosphorus (nutrient) concentrations are low, they occasionally exceed 8.0 parts per billion considered more typical of a moderately nutrient enriched (greener) water body. Supplemental phosphorus samples have been collected in select stream inlets: Meadow, Quimby and Young Brook. The stream water phosphorus concentrations are typically higher than those measured in Pine River Pond.

Water clarity, chlorophyll *a*, and total phosphorus data presented in this Long Term Trend section were collected by the New Hampshire Volunteer Lake Assessment Program and by the University of New Hampshire Lakes Lay Monitoring Program.

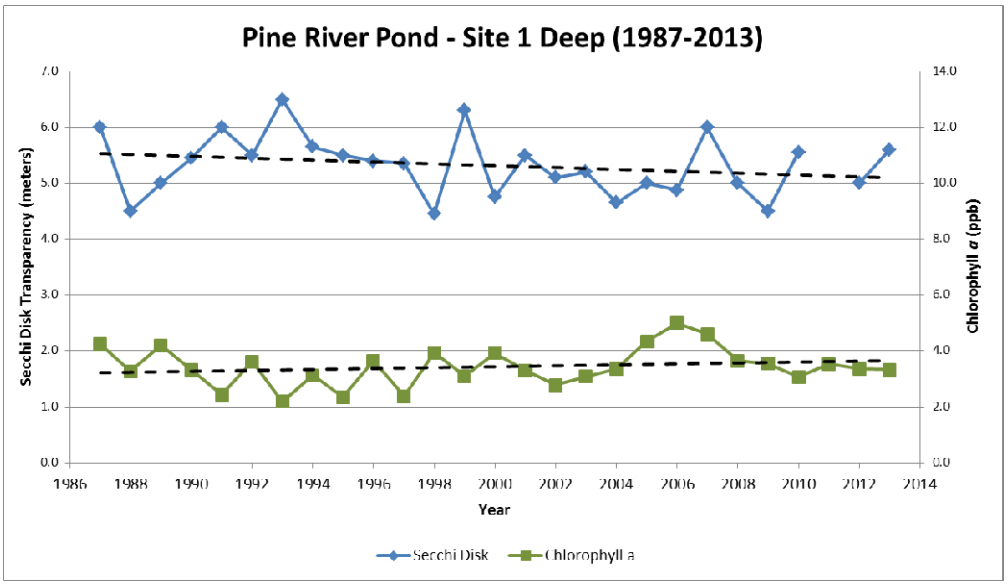


Figure 2. Changes in water clarity (Secchi disk depth) and chlorophyll *a* measured from 1987-2013 at Site 1 Deep. There has been a slight declining water clarity trend (dashed line). Decreasing water clarity is a negative trend for lakes if caused by increased algae or polluted runoff. Algal growth (chlorophyll; dashed line) has increased slightly since 1987.

Recommendations:

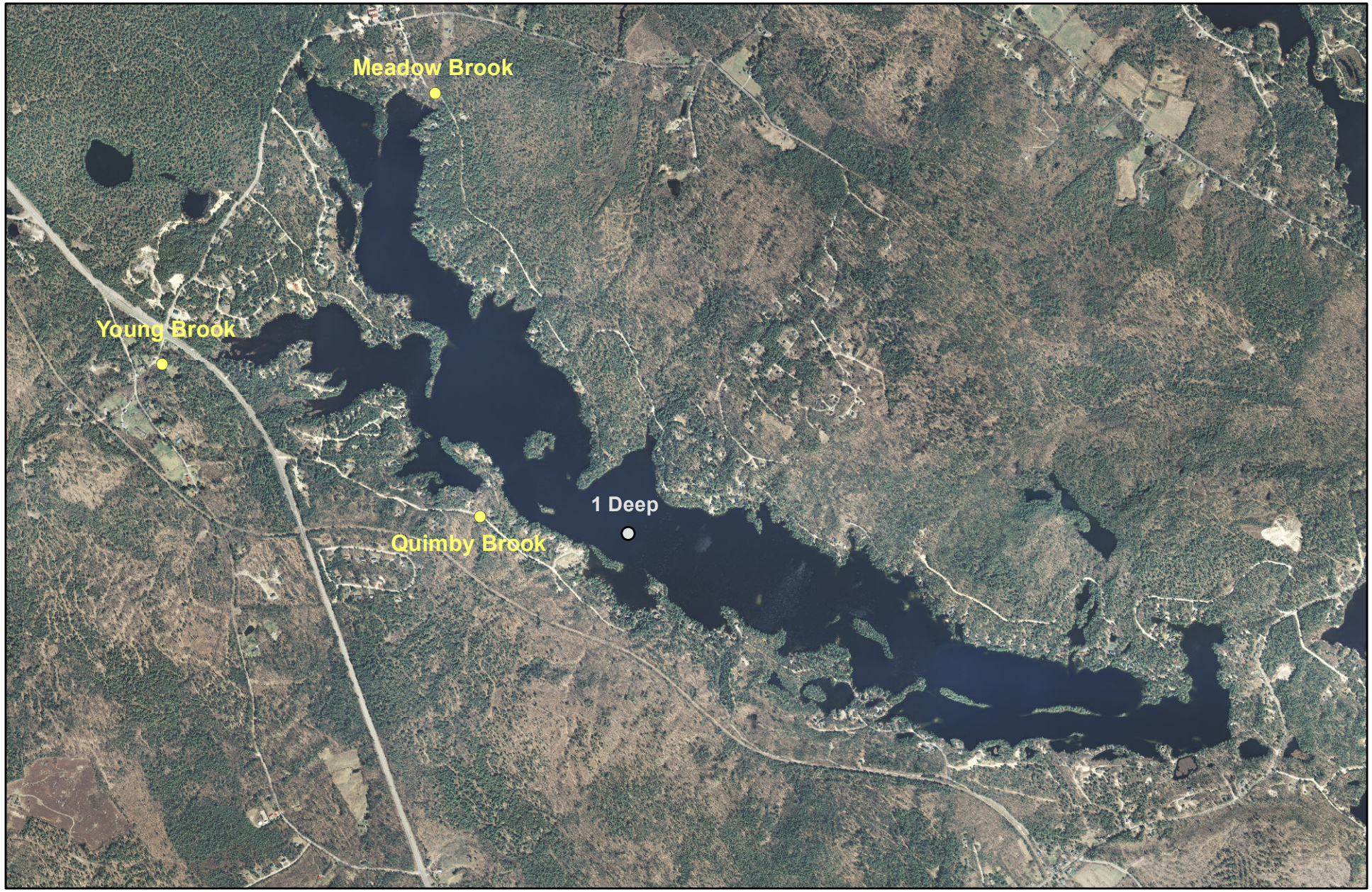
- Implement Best Management Practices within the Pine River Pond watershed to minimize the adverse impacts of polluted runoff and erosion into the lake. Refer to "Landscaping at the Water's Edge: An Ecological Approach" and "New Hampshire Homeowner's Guide to Stormwater Management: Do-It-Yourself Stormwater Solutions for Your Home" for more information on how to reduce nutrient loading caused by overland run-off. The Acton Wakefield Watershed Alliance also offers technical assistance to help design and implement erosion control project that protect water quality.
  https://extension.unh.edu/resources/files/Resource001799_Rep2518.pdf
  http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-11-11.pdf

- Implement a simple cyanobacteria monitoring routine into the conventional water quality monitoring methods. Cyanobacteria collections throughout the summer and fall months can give insight into how these populations are distributed throughout the seasons and when they are most likely to reach harmful levels. If you are interested in discussing additional water quality monitoring options that would meet your needs please contact Bob Craycraft @ 862-3696 or via email, bob.craycraft@unh.edu.

Pine River Pond

Wakefield, NH

2013 Deep water sampling site and tributary sample sites



Aerial Orthophoto Source: NH GRANIT
Site locations GPSed by the UNH Center of Freshwater Biology

University of New Hampshire Cooperative Extension

New Hampshire Lakes Lay Monitoring